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What Did Unions Do?
An Analysis of Canadian Strike Data, 1901-14

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Abstract / Résumé

Using a new data source on early Canadian strikes, this paper seeks to explain the determinants of strike durations, 1901-14. Three different approaches are evaluated: a screening model, a strike-waves model, and a war-of-attrition model. The results are sensitive to strike issue. For non-wage issue strikes, the screening model performs poorly. A strike-waves model that incorporates elements of a war-of-attrition is best suited to explain the durations of multiple-issue strikes. The determinants of durations for the period are compared with findings for the period after 1945.

Avec l'aide d'une nouvelle source de données sur les grèves canadiennes, cet article cherche à expliquer les facteurs déterminants dans la durée des grèves pour la période allant de 1901 à 1914. Trois approches différentes sont évaluées : un modèle *screening*, un modèle vague-de-grèves, et un modèle de guerre d'usure. Les résultats sont directement liés aux facteurs mis en jeu dans les grèves. Pour les grèves dont les points de litige ne portent pas sur les revenus, le modèle *screening* n'est pas très adéquat. Un modèle vague-de-grève qui incorpore les éléments d'un modèle de guerre d'usure offre un meilleur cadre pour analyser les durées des grèves ayant de multiples points de litige. Les facteurs déterminants dans la durée des grèves pour la période sont comparés aux résultats trouvés pour la période d'après 1945.

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I. Introduction

Gavin Wright (1987) observed that economic history forms a bridge between labour economics and labour history. The gap between the disciplines is most evident in their different approaches to studying the determinants of strikes and strike dimensions. The aim of this paper is to bring together recent contributions by labour economists and historians in an analysis of strike durations, using a new source on individual strikes in Canada between 1901 and 1914.

Three approaches to strike durations are evaluated. The first approach is associated with the new information economics. In explaining the stylized facts that periods of economic expansion are associated with more but shorter strikes, this approach posits that workers go on strike to get information about the profitability of firms.[1] Empirical tests of this model for Canada, Harrison and Stewart (1989) is the best example, have been restricted to the post 1945 period.[2] This begs the question: how robust are these models? Before union consolidation environmental variability was great and it was difficult for workers to discriminate between profitable and unprofitable firms, leaving aside whether they could distinguish between good and bad economic states. As collective bargaining became regularized, more information would have been increasingly available to both parties on wage offers and demands, and there would have been alternatives to strikes. It would be expected, therefore, that with union consolidation strike frequencies would be reduced and they would be limited to periods of cyclical change when environmental variability was greatest. At issue, then, is when these changes occurred.

The second approach to strike durations is associated with the "strike wave hypothesis." Labour historians have emphasised mobilization factors in explaining the frequency and duration of strikes before 1914. The literature for the most part sees strikes in the period before 1914 as a struggle for union representation, better working conditions, and control of the labour process. Strikes often took place in waves which were not necessarily related to the business cycle, as the new information economics maintains.

The third approach is associated with a war-of-attrition model which in fact combines many of the attributes of asymmetric information models and those found in the labour history literature. Whereas screening or signalling models are appropriate where gains are divisible, a war-of-attrition model is appropriate in win or lose situations. The war continues until one side quits. The decision to quit depends in turn on fixed costs. In a situation where there are multiple issues in dispute, fixed costs are high. Loosing on wages might mean loosing on working hours or union recognition.

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[1] Indeed these features provide the "key test" (Kennan and Wilson 1989) in selecting among models.

[2] For a related model, see Cousineau and Lacroix (1986).

In this type of model both parties have private information, and strike waves would have made it difficult for both parties to get information about each other, thereby lengthening durations, independent of the economic environment.

Because of data limitations we try the asymmetric information and strike wave models directly, and the war-of-attrition model *in absentia*. We find that labour history and labour economics are indeed complementary. While the economics literature needs to incorporate the historical context in evaluating models, the historian needs theory to assess the relative importance of mobilization and cyclical strikes.

The next section presents a review of the history and economics literature. The data source is described in Section 3. Section 4 introduces the hazard model and Section 5 gives the results. A concluding section discusses the application of strike models in their historical context.

II. Literature Review

The basic feature of the new information models in explaining strike behaviour is its rejection of the notion that strikes are irrational. Why do workers and firms fail to settle disputes since a strike implies that the pie is getting smaller? The leading candidate in explaining this apparent inefficiency is the screening model. Poorly informed unions with monopoly power use strikes to discriminate among firms of different profitability by exploiting the impatience of high-profit firms to settle quickly for high wages. Strike incidence should be procyclical because it would be associated with greater uncertainty about firms' profits (e.g. an inflationary period). Wage settlements would fall as duration increased. The empirical evidence in support of this class of models is mixed. McConnell (1989) found that in the U.S. wages fell with time to settlement, but Card (1990) analyzing Canadian contract data found no direct relationship.

A further problem with the screening model is that it has difficulty in explaining the countercyclical duration of strikes.[3] In Hayes' (1984) model potential strikes will last longer if the situation anticipated by the union does not materialize; conversely if there is an increased probability that the firm's ability to pay will be low, the union's initial wage demands will be reduced, and potential strikes will be shorter. However, there is a well established body of evidence (Kennan 1986) showing that settlement rates are procyclical. Harrison and Stewart (1989) using a data set for Canada for 1946-1983, reported mean durations of 31 days for high-production months, and 41 days for low production months; similar results are reported by Gunderson and Melino (1990).

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[3] This is important for our purposes because our data set, like others for the early period, does not include observations on wage settlements.

In reconciling the evidence and the screening model, Kennan and Wilson (1989) showed that the model is sensitive to bargaining procedures, such as whether the union, the firms, or both make wage offers, and the frequency of offers. It is in the union's interest to delay the time interval between offers. If it can show that it can delay offers, it will encourage the firm to accept an initial high offer. The union's problem is essentially one of building and maintaining a reputation that its offers will be infrequent. Unions might find it difficult to commit to infrequent higher offers in boom times — and durations are countercyclical — because its membership might have alternative opportunities. During trade slowdowns unions might have better control over their membership.

Because of the sensitivity of the basic screening model to its assumptions about bargaining procedures and environment, one possibility to evaluating its explanatory power is to examine an earlier period when unions had obviously less control over membership.[4] Card and Olson (1992) have turned their attention to the late nineteenth century, but there are no comparable studies for Canada. When did the countercyclical pattern of durations begin? Are strike durations unrelated to the bargaining environment?

For more than a decade, a new generation of Canadian labour historians has been exploring many of these issues. Much of this work has been published in *Labour/Le Travail*, and summaries of this literature are found in Palmer (1992) and Morton (1988). Although there is some agonizing over finding trends or explaining Canadian 'exceptionalism,' this new research situates strikes in their historical context: their location, sector, and political, legal and social background. Kealey (1989, p. 228) wrote: "Each national working class experience must be studied historically and understood in light of contrasting experience, not held up against a reified model, which never existed." This literature has eschewed quantitative methods and questions. An exception is the work of Kealey himself (1989, Cruikshank and Kealey 1987) who, in a project for the Canadian Historical Atlas has revised Canadian strike data and, using the familiar framework of Shorter and Tilly (1974), has produced statistics on strike dimensions from 1891 to 1961.

Several aspects of the Canadian experience appear to have affected the duration of strikes, although at times there appears to be little if no consensus about the direction of the effect. It is has been argued that strike durations were longer in the Maritimes where there were bitter disputes in the mining sector and those involving unskilled labour (McKay 1988), but resource industries in other parts of the country exhibited many of the same features as well (Mouat 1990). For the entire country the relative proportion of male workers involved in a strike is thought to have increased durations. Yet women workers were not immune from militancy (Ferland 1989).

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[4] What exactly constituted a union in the early period is often difficult to judge. Many of the unions were clearly not permanent. Indeed many of the strikes analyzed in this paper were held without a union present.

There is also lack of agreement about the effect of the legal environment. It has been suggested that the introduction of the Industrial Disputes Investigation Act in 1907 reduced the propensity to strike and that it also shortened the length of disputes because of the exchange of offers before the strike was called.[5] The act assured that "[b]etter information could be provided to both parties by having the government collect and publish various types of statistics. With such support, disputes would not result from misunderstanding of the true situation facing the parties (Cruikshank 1993)." The 1907 Act was limited to the mining, utilities and transportation sector — not surprising given the importance of exports in the economy — but other sectors were affected indirectly by the change in legal environment, if only because they feared intervention as well. However, Huxley (1979) offers the countervailing view that any strike that occurred after mediation would have been a long strike anyway.

A distinguishing feature of this period was the growth of international unionism. It may be speculated that international unions grew because of their ability to withstand longer strikes (Maki 1986). Even in Quebec where national unions were entrenched, "les périodes de dépression étaient funestes pour les syndicats fragiles comme l'étaient les syndicats nationaux (Rouillard 1979, p. 134)." But others have argued that internationals were less militant with their interest focussed more on single — and narrow — wage issues (Babcock 1975; Zerker 1982).

There appears to more of a consensus about the role of strike waves. In his own description of the data until 1930, Kealey observed the cyclical character of strikes before 1930, but he emphasized the strike waves of 1899-1903, 1912-1913, and 1917-20, and the political, regional and sectoral features of these mobilizations. These strike waves were international (Haimson and Tilly 1989). In all countries workers in metal processing and mechanical enterprises were particularly affected by changes in organization and technology, and they were among the most militant participants in strike waves. As for timing, Boll (1989) in his study of Germany found that while strike waves may have begun in good economic states with short durations, they persisted. Haimson (1989, p. 525) summarizing the state of research observed:

> What distinguished these strike waves of labor unrest was the degree to which, at least among the strata of workers who were most militantly involved in them, all forms of labor unrest — including ostensibly economic strikes — came to focus explicitly over issues of power and authority. Even more notable was the acuteness of the sense that these strata of workers came to display the inextricable link between their position in the workplace — and particularly the issue of control over the character and pace of their own work — and their position in the polity as a whole.

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[5] For a history of the IDIA and industries affected see Craven (1980) and Russell (1990).

These strike waves can be incorporated in a war of attrition model. Unlike the screening model, the war of attrition model assumes that both parties have private information about the delay costs of settling disputes. Each party continues in a dispute as long as its privately known cost of continuation is less than the expected gain (the value of the prize times the probability the other party will soon capitulate). As the dispute continues, each party's assessment of the probability that the other will capitulate declines; eventually one of them acquiesces to stop the rising costs of delay, thus leading to a winner-take-all settlement. In situations where firms and workers are disputing multiple issues, the costs of quitting are high, if losing the battle about wages implies losing union recognition. This class of models thus predicts declining settlement rates (the quit rate also declines with time, since players with lower delay costs have later stopping times); but they provide no clue to cyclical frequencies because the model implies that incidence depends on the extent of uncertainties about delay costs.

Strike waves such as those occurring in the early twentieth century exhibited some of these features. Strikes in these periods were generally about multiple issues and they made for uncertainties about the parties' evaluations of their own costs of delay, and each others'. From the perspective of firms, it was uncertain whether losing the battle of attrition meant losing the war against union consolidation, and whether union recognition would lower their long-term profitability.[6] For workers, it was unknown whether a firm's recognition of their demands during boom periods would be repeated, and whether firms would always deal with their union. Strike waves clearly made for unstable bargaining relationships (Mauro 1982). As a result of these uncertainties, how the war of attrition was resolved and its effect on duration can best be understood in terms of the historical context.

III. Data

The data used in this paper to evaluate screening and war of attrition models are from the Strikes and Lockouts File of the Department of Labour in Canada. In response to the growing number of work stoppages in the late nineteenth and early twentieth centuries, the Department began collecting detailed information on strikes: length of dispute, size of workforce involved, cause of dispute, how the strike was settled, in whose favor, and so on.[7]

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[6] This fits aptly Plamer's (1992, p. 172) description of strikes in the Maritimes: "Employers imported strike breakers by the thousands [and] stood fast against unionism...They had won the battle, but they would lose a war..."

[7] For a history of the Department of Labour see Craven (1980).

The reports did not include some important information, notably on the actual wage settled upon at the end of the dispute. A further drawback is that strike results were ambiguous. A strike outcome was often recorded as a success, failure or compromise; but many results, especially for short strikes of less than five days, were left as undetermined or "indefinite." The presence of compromise and undetermined results poses a serious problem for estimating a pure war-of-attrition model in a competing risk framework, and we are thus forced to adopt a single-risk approach in the following section.[8]

From the files we have been able to assemble a data set of 1182 strikes. Appendix 1 gives definitions of variables and industries covered. This does not represent the entire population of Canadian strikes in the period, but the time series of the strikes from the files corresponds with the aggregate time series reported by the Department of Labour (Urquhart and Buckley 1983). As for the geographic and sectoral distribution of strikes, it is probably the case that the reports to the Department may underestimate strikes in Quebec and in eastern and western regions, but it is unclear how serious this bias affects the analysis that follows.

The basic descriptive statistics of the sample are reported in Tables 1-3. Table 1 reports the means for all variables.[9] For indicator variables, the mean represents the relevant percentage. Thus 3.1% of strikes were violent; and the number of strikes resulting in a compromise was about forty percent. Table 2 examines strikes by issue. The mean (median) duration of strikes in the early period (22.7 (7)) was less than that for the period after 1945 (35.51 (20)) reported by Harrison and Stewart[10]. Single issue strikes over wages comprised about 45 percent of all strikes; single issue strikes over unionisation, less than 10 percent; and multiple issue strikes involving unionisation, 20 percent. Consider as well that for the medium and smaller samples, for which information about union presence is available, the percentage of single wage issue strikes is only 8 percent, but for the large sample it is about 45 percent. The high proportion of multiple issue strikes that included wage disputes stands in contrast to the post 1945 period when less than 50 percent of strikes were about wages. It may be speculated, therefore, that the early period sample underestimates union and work related strikes. Although strikes were reported to be ostensibly about wages, they may have represented additional issues to the parties involved.

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[8] Card and Olson (1992) have more confidence in strike outcomes for the U.S.

[9] Three sample sizes are used in the estimations to take into acount different information about whether unions were involved (N = 698) and whether the union was an international or Canadian (N = 551). The large sample (N =1129) gives no information on union involvement. See the next section for further discussion.

[10] Card and Olson (1992) in their study for the U.S. in the 1880s found a comparable mean (median) of 20 (9) days; they also reported that 47 percent of strikes were about wages. For a discussion of the significance of wage issue strikes in the early period, see Montgomery (1987, p. 91).

Duration varied by issue as has been found in studies of the post WWII period. Multiple issue strikes and strikes involving unionisation lasted longer than wage issue strikes, as would be expected in a war-of-attrition model. Note that Harrison and Stewart found the opposite for the early period, and it might be speculated that after 1945 gains were more easily divisible between the parties. There was also variation by industry as summarized in Table 2. Metal workers strikes were only a little longer than the average, but strikes of machine workers lasted more than five times as long as transport workers, three times as long as unskilled workers, and twice as long as building trade workers. Strikes by region did not vary much, and this again is in contrast to Harrison and Stewart who found that strikes outside Central Canada (Quebec and Ontario) lasted slightly longer. Table 4 examines the survival rate of all strikes by year. The number of strikes shows roughly a cyclical pattern, peaking in 1903, 1907, and 1912-1913. These coincide approximately with the peak years (Dec. 1902, Dec. 1906, Nov. 1912) identified by White (1970) in his comprehensive study of business cycles in Canada. This would offer some support to the screening model of strike behaviour. Table 4 also shows survival rates or the proportion of strikes beginning in that year that lasted at least as long as the stated number of days. The number of strikes lasting at least as long as 25 days does correspond to movements in the cycle, rising in 1903 and 1912 and 1913. Durations in 1909 appear to pose a problem to models that predict procyclical durations.

To capture the heterogeneity of strikes we estimate the hazards, that is the sample estimates of the sequence of conditional settlement probabilities by strike issue. We follow Kennan (1985) and Harrison and Stewart and estimate this as

$$h(t) = \frac{\sum_{i=t-r}^{t+r} n(i)}{\sum_{i=t-r}^{t+r} N(i)} \quad ,$$

where n(t) is the number of strikes with duration of exactly t days, and N(t) is the number of strikes with the duration of at least t days. Smoothing is required because of the small number of strikes settled on any one day as t gets large; following others we set r, for each t, to keep the denominator sufficiently large that the standard error of the estimate never exceeds 0.03 percent. As shown in Figure 1, settlement probabilities are higher for wage (12 percent) than union (9 percent) issue strikes, and

that the latter declines at a greater rate before flattening out.[11] A wage strike lasting between 10 and 20 days was settled twice as quickly as a union issue strike. Note that Harrison and Stewart found the wage issue strikes had a lower initial settlement rate (3 percent compared to 11 percent for non-wage strikes) and then declined steadily. Returning to the earlier period, the rate of settlement gives some support to the war of attrition model.

In sum, the basic descriptive statistics highlight the significance of multiple issue strikes, but screening models are most appropriate where the gains are divisible. The following sections investigate whether the nature of strike issue also affected duration.

IV. The Underlying Model

Hazard models provide the standard means for evaluating the determinants of strike duration. The basic approach has been described in detail elsewhere (Kiefer 1988). Here we focus on features relevant to our needs.

The hazard or settlement rate is defined as

$$(1) \qquad h(t) = \lim_{\Delta \to 0} (\text{Prob}(t \leq T \leq \Delta + t)/\Delta),$$

where T represents the duration of the strike. The numerator in the limit is simply the conditional probability that the strike will end in the next interval, from t to $t + \Delta$, given that it has already lasted t days. The settlement rate is "roughly...the rate at which spells are completed after duration t, given that they last at least until t (Greene 1993)." This hazard rate can be expressed in several ways including

$$(2) \qquad = \lim_{\Delta \to 0}((F(t + \Delta) - F(t))/ \Delta S(t));$$

$$(3) \qquad = f(t)/ S(t),$$

where $F(t) = \text{prob}(T \leq t)$ is the cumulative probability - the unconditional probability that the strike duration is less than or equal to t; where the survival function is $S(t) = 1 - F(t)$ or the unconditional probability that duration is greater or equal to t; and where f(t) is the pdf, or the probability density function for duration.

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[11] Many strikes end at multiples of seven days and this may be due to reporting conventions. As a result there may be some errors in the reporting of actual strike lengths that is difficult to correct for. The fact that many strikes lasted a multiple of seven days should have no effect on the estimated hazard functions reported in the following section.

Note that since $h(t)S(t) = f(t)$, hazard function estimation can be viewed as maximum likelihood estimation parameterized in terms of a hazard function and a survival function. The log-likelihood function is

(4) $$\sum \log h(t) + \sum \log S(t) = \sum \log f(t).$$

There are several possible functional forms for the hazard function. Specification tests (Jaggia 1991) on a variety of functional forms (exponential, log-normal, log-logistic) led to the use of the log-logistic form. Thus,

(5) $$h(t) = \prod p(\prod t)^{p-1}/\{1 + (\prod t)^{p-1}\};$$

(6) $$S(t) = 1/\{1 + (\prod t)^{p-1}\}.$$

In this setup, p is a parameter of the hazard function. With a log-logistic form, the hazard function declines monotonically for $p < 1$. If $p > 1$, the hazard function initially rises, reaches a maximum and then declines monotonically thereafter. The effect of firm and worker characteristics, policy initiatives, macroeconomics indicators and other relevant variables on duration enter through $\prod$ by defining $\prod$ as $\exp(-\beta'X)$. In this model the expected value of the log duration is:

(7) $$E(\ln t) = -\ln \prod = \beta'X.$$

Thus the coefficients on the independent variables in the hazard model are the partial derivatives of the expected value of log duration with respect to the corresponding independent variable. Some other useful relationships for interpreting log-logisitc hazard function results are:

(8) $$\text{median duration} = 1/\prod;$$

(9) $$\partial \text{median}/\partial X_j = \beta_j \text{ x (a positive term)};$$

(10) $$\partial h(t)/ dXj = \beta_j \text{ x (a negative term)}.$$

Note that if duration is negatively related to the independent variable, the settlement rate is positively related to that variable. That is, if the expected duration is shorter, the probability of settlement at any given time is higher.

V. Results

Table 5 presents results from hazard estimation and OLS with log duration as the dependent variable. Information on whether a union was involved and whether it was a national (Canadian) or international organization was sketchy and as a result, three

samples sizes were used. Estimation based on the small sample allowed us to distinguish between union types; the medium sample included a union variable only; the large size sample omits the union variable. (The OLS results reported are restricted to the medium sized sample.) For each hazard estimate, the last row reports the change in the predicted duration due to (1) the change of the respective dummy variable from 0 to 1; or (2) the change of the non-dummy variable from its mean value to mean +1. For the large sized sample for example, the addition of one hundred extra workers to a strike, adds about two days to a strike. In all models the real GNP variable [Altman (1993) correction of Green and Urquhart (1994)] is measured as deviations from trend.

When hazard function estimation is used to study the determinants of strike duration, the overall specification of the model can be tested through an examination of the distribution of the generalized residuals, where a generalized residual is defined as the negative of the log of the estimated survival rate (Table 6). A conditional moment test based on the 2nd, 3rd, and 4th central moments of the generalized residuals (Jaggia 1991) does not reveal any specification problems for the model based on the small sample which contains full information on all of our variables. When we move to the medium sample where the international union dummy is omitted, there is only slight evidence of misspecification, as the test indicates no misspecification only at 1 and 2.5% levels of significance. As we move to the large sample where all variables regarding union involvement are omitted, there are stronger signs of misspecification. It should also be noted, that although other functional forms (Weibull, log-normal, and exponential) yielded similar qualitative results for the hazard model, the log logistic model performed best in terms of the conditional moment tests for misspecification.

Returning to Table 5, our more important findings are:

• Bigger (i.e. more strikers) strikes and strikes involving more than one firm lasted longer. Although Kennan (1985) found that in the U.S. settlements for large strikes after WWII had a distinct U-shaped pattern — settlement rates were initially lower for larger strikes, there then followed a period in which settlement rates increase with duration, followed by a decline in settlement rates after 90 days — Gunderson and Melino (1990) found that for Canada between 1967 and 1985 the number of workers had an insignificant effect on strike durations. More recently, Harrison and Stewart (1993) found that the effect of strike size on duration depends on issue and industry, and that the effect is usually, but not always linear.

• The number of strikes (whether lagged or current) — an indicator of a strike wave — was positive and significant when the large and medium sized samples were used.[12] Violence, which was a feature of strike waves, also led to longer strikes. In other

[12] In other regressions (not reported) the correlation between the strike wave variable and changes in GNP was weak.

regressions (not reported) union membership was also included as a regressor, but because of multicollinearity with the GNP variable it was dropped.

• Disputes including women were not different from those involving men only, raising issue with Palmer's (1992, p. 193) description that "[r]adicalism took on the trappings of a masculine project."

• The regression results show there was no difference in duration whether the strike was led by an International or Canadian union. Why international unions were successful thus remains an open question.

• Although the labour history literature has made much of the regional diversity of strike behaviour, durations were not significantly different across the country. The regional nature of strikes is closely associated with seasonal factors.[13] It was difficult to test for the latter directly because many of the reports on shorter strikes (less than five days) simply recorded days lost, and not the actual dates of strike.

• In other regressions (not reported) city effects were included as a regressor. Neither the population of cities nor the change in population between the census dates of 1901 and 1911 affected duration.

• As in other countries strikes in Canada among skilled and machine workers who were faced by changes in managerial techniques and work organization lasted longer than other disputes. These findings are consistent with Palmer's claims (p. 173) that textile and garment workers who "waged similar struggles against the modernization of the labour process" were unsuccessful.

• The regression results for the large sample indicate that the IDIA act which intended to reduce information costs and regularize bargaining did indeed have the result of shortening disputes. The results are less than robust, however; still in all cases the sign on the dummy for 1907 is negative which runs counter to the hypothesis (Huxley 1979) that legislation had the perverse result of lengthening disputes that did occur.

• The output variables indicate that the response of durations to output depended on the strike issue. Wage and work issue strikes were countercyclical. The relevant coefficients are the sum of the GNP and interaction variables which are reported in Table 7. For all hazard models, the absolute value of the t-statistics for wage issue strikes are greater than two; there is weaker evidence regarding the countercyclicality of work, union, and multiple issue strikes. Other ways of measuring output changes were tried, including an indicator for good and bad years, but the results were not changed greatly.

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[13] The industry effects also incorporate a seasonal component. The construction industry, for example, would only experience strikes in non-winter months.

V. Discussion and Concluding Remarks

The period 1901-14 were years of transition in Canadian industrial relations, and in comparison with the period after 1945 there was a higher proportion of multiple issue strikes and settlement rates declined over time. In this context the screening model does not perform well. Durations were affected by the nature of the dispute as one would expect in a war-of-attrition model. Workers would hold out as long as possible to initiate unionization or preserve gains in working conditions earned in previous disputes. These disputes were often present in strike waves that did not necessarily correspond to the business cycle before 1914. This result confirms similar findings on the growth of union membership and the business cycle.[14]

The countercyclical duration of wage issue strikes suggests that screening models, like the variant proposed by Kennan and Wilson, might be appropriate in periods where unions are well established, and when multiple issue strikes declined. As unions consolidated they began to serve the important function of acquiring information for their members about the profitability of firms, and it was only then the duration of union led disputes about wages were both longer and countercyclical. Put differently, only when the gains were divisible as in wage issue strikes, is the screening model appropriate. In light of our introductory observations, models of strikes need to be considered in their historical setting.

[14] For a review of this literature see Lacroix (1986).

Appendix 1

Variable Definitions:

1. Strikers: Number of strikers.
2. Female Strikers: Dummy variable equal to one if some or all of the strikers were female.
3. Firms: Dummy variable equal to one if more than one firm is involved in the strike.
4. Strike Issues:
   - Multiple: Dummy variable equal to one for strikes involving two or more issues.
   - Wage: Dummy variable equal to one for single issue strikes over wages.
   - Union: Dummy variable equal to one for single issue strikes over unionisation.
   - Working Conditions: Dummy variable equal to one for single issue strikes over working conditions.
5. Union Involvement: Dummy variable equal to one if a union was involved in the strike.
6. International Union: Dummy variable equal to one if an international union was involved in the strike.
7. Legislation (1907) : Dummy variable equal to one in the years after the introduction of the Industrial Disputes Act;
8. Year: Annual time trend.
9. Skill : Dummy variable equal to one if the strikers were skilled workers. Violence: Dummy variable equal to one if there were violent episodes during the strike.
10. Location:
    - West: Dummy variable equal to one if the strike took place in Manitoba, Saskatchewan, Alberta, or British Columbia.
    - East: Dummy variable equal to one if the strike took place in Nova Scotia, New Brunswick, Newfoundland, or Prince Edward Island;
11. Industry Effects: Dummy variables equal to one if the strikers worked in the particular industry grouping defined as:
    - Apparel and Textiles: All textile garment workers (fur, cotton and woolens), hatters, tailors, and jewelry workers.
    - Building Trades: Bricklayers, carpenters, engineers, marble workers, and plumbers.
    - Unskilled. Unskilled building labourers and general labourers.
    - Food and Tobacco: Includes brewery workers.
    - Machine: Boilermakers, machinists, and stove molders.
    - Metals: Blacksmiths, iron moulders, metal and iron workers, and wire drawers.
    - Mining: Includes oil drillers.
    - Shoes and Other Skilled: Includes leather workers and coopers.
    - Transportation and Utilities: Includes street labourers, all types of railway workers.
    - Wood Products: Includes paper workers.
    - Service and Public Sector: Includes barbers, civic labor, telephone workers and musicians.
    - Miscellaneous Manufacturing: Includes auto workers, glass and piano makers, and printers.
    - Other: Includes fishermen, agriculture workers, and other workers who could not be grouped as construction labourers.
12. Output Effects:
    - GNP: Deviations of GNP from trend levels in the year of the strike.
13. Strike Wave: Total number of strikes in the year of the strike.

References

Altman, M. 1992. "Revised Real Canadian GNP Estimates and Canadian Economic Growth, 1870-1926." *Review of Income and Wealth*, 455-73.

Anderson, J. C. and Gunderson, M. 1982. "Strikes and Dispute Resolution." In J.C. Anderson, M. Gunderson, and A. Ponak eds., *Union-Management Relations in Canada*, 2nd ed. Don Mills, Ontario.

Babcock, R. 1975. *Gompers in Canada: A Study of American Continentalism Before the First World War*. Toronto.

Boll, F. 1989. "Changing Forms of Labor Conflict: Secular Development or Strike Waves." In L. Haimson, L. and C. Tilly, C, eds., *Strikes, Wars, and Revolutions in International Perspective: Strike Waves in the Late Nineteenth and Early Twentieth Centuries*. Cambridge.

Card, D. 1990. "Strikes and Wages: A Test of the Signalling Model." *Quarterly Journal of Economics* 105, 625-59.

Card, D. and Olson, C. A. 1992. "Bargaining Power, Strike Duration, and Wage Outcmes: An Analysis of Strikes in the 1880s." National Bureau of Economic Research, Working Paper 4075.

Cousineau, J.M. and Lacroix, R. 1986. "Imperfect Information and Strikes: An Analysis of Canadian Experience, 1967-82." *Industrial and Labor Relations Review* 39, 377-87.

Craven, P. 1980. *An Impartial Umpire: Industrial Relations and the Canadian State, 1900-1911*. Toronto.

Cruikshank, D. and Kealey, G. S. 1987. "Strikes in Canada, 1891-1950." *Labour/Le Travail* 20, 85-145.

Cruikshank, K. 1993. "Policy Entrepreneurs and Regulatory Innovation: Simon James McLean, William Lyon MacKenzie King and Business Government Relations in the Age of Laurier." In P. A. Baskerville, ed., *Canadian Papers in Business History*, Vol. 2. Victoria, British Columbia.

Ferland, Jacques. 1989. "'In Search of Unbound Prometheia': A Comparative View of Women's Activism in Two Quebec Industries, 1869-1908," *Labour/Le Travail* 24, 11-44.

Friedman, G. 1988. "Strike Success and Union Ideology: The United States and France, 1880-1914." *Journal of Economic History* 48, 1-26.

Green, A. G. and Urquhart, M. C. 1994. "New Estimates of Output Growth in Canada: Measurement and Interpretation. In D. McCalla and M. Huberman, eds., *Perspectives on Canadian Economic History*, 2nd ed. Toronto.

Greene, W. H. 1993. *Econometric Analysis*. New York: MacMillan.

Gunderson, M., Kervin, J., and Reid, F. 1989. "The Effect of Labour Relations on Strike Incidence." *Canadian Journal of Economics* 4, 779-94.

Gunderson, M. and Melino, A. 1990. "The Effects of Public Policy on Strike Durations." *Journal of Labor Economics* 8, 295-316.

Haimson, L. and Tilly, C. Editors. 1989. *Strikes, Wars, and Revolutions in International Perspective: Strike Waves in the Late Nineteenth and Early Twentieth Centuries*. Cambridge.

Hayes, B. 1984. "Unions and Strikes with Asymmetric Information." *Journal of Labor Economics* 2, 57-83.

Huxley, C. 1979. "The State, Collective Bargaining and the Shape of Strikes in Canada." *Canadian Journal of Sociology* 4, 223-39.

Jaggia, S. 1991. "Tests of Moment Restrictions in Parametricc Duration Models." *Economics Letters* 37, 35-38.

Kealey, G.S. 1989. "The Parameters of Class Conflict: Strikes in Canada, 1891-1930." In D.R. Hopkin and G.S. Kealey, eds., *Class, Community and the Labour Movement: Wales in Canada, 1850-1930*. Canadian Committee on Labour History.

Keifer, N. M. 1988. "Economic Duration Data and Hazard Functions." *Journal of Economic Literature* 26, 646-79.

Kennan, J. 1980. "Pareto Optimality and the Economics of Strike Duration." *Journal of Labor Research* 1, 77-94.

Kennan, J. 1985. "The Duration of Contract Strikes in US Manufacturing." *Journal of Econometrics* 28, 5-22.

Kennan, J. 1986. "The Economics of Strikes." In O. Ashenfelter and R. Layard, eds., *Handbook of Labor Economics*, Vol. 2. New York.

Kennan, J, and Wilson, R. 1989. "Strategic Bargaining Models and Interpretation of Strike data." *Journal of Applied Econometrics* 4, S87-S130.

Lacroix, R. 1986. "Strike Activity in Canada." In W.C. Riddell, ed., *Canadian Labour Relations*. Toronto.

Maki, D.R. 1986. "The Effect of the Cost of Strikes on the Volume of Strike Activity." *Industrial and Labor Relations Review* 39, 552-63.

Mauro, M.J. 1982. "Strikes as a Result of Imperfect Information." *Industrial and Labor Relations Review* 35, 522-38.

McConnel, S. 1989. "Strikes, Wages and Private Information." *American Economic Review* 79, 801-15.

McConnell, S. 1990. "Cyclical Fluctuations in Strike Activity." *Industrial and Labor Relations Review* 44, 130-43.

McKay, I. 1988. "Strikes in the Maritimes, 1901-1914." In P.A. Buckner and D. Frank, eds., *Atlantic Canada Since Confederation*. Fredricton.

Montgomery, D. 1987. *The Fall of the House of Labor: The Workplace, the State, and American Labor Activism, 1865-1925*. Cambridge, Mass.

Morton, D. 1988. "Labour and Industrial Relations History in English Speaking Canada." In G. Herbert, *et al.*,*The Stae of the Art in Industrial Relations*. Canadian Industrial Relations Association.

Mouat, J. 1990. "The Genesis of Western Exceptionalism: British Columbia's Hard-Rock Miners, 1895-1903." *Canadian Historical Review*.

Palmer, B. 1983. *Working Class Experience*. Toronto.

Reder, M.W. and Neumann, G.R. "Conflict and Contact: The Case of Strikes." *Journal of Political Economy* 88, 867-86.

Rouillard, J. 1979. *Les syndicats nationaux au Québec de 1900 - 1930*. Québec, Québec.

Russell, Bob. 1990. *Back to Work: Labour, State and Industrial Relations in Canada*. Scarborough, Ontario.

Shorter, E. and Tilly, C. 1974. *Strikes in France, 1830-1968*. Cambridge.

Tracy, J. 1986. "An Investigation into the Determinants of U.S. Strike Activity." *American Economic Review* 76, 423-36.

Urquhart, M.C. and Buckley K.A.H. 1983. *Historical Statistics of Canada*, 2nd ed. Ottawa.

White, D. A. 1970. *Business Cycles in Canada*. Ottawa.

Wright, G. 1987. "Labour History and Labour Economics." In A.J. Field ed., *The Future of Economic History*. Boston.

Zerker, S. 1982. *The Rise and Fall of the Toronto Typographical Union, 1832-1972: A Case Study of Foreign Domination*. Toronto,

TABLE 1

MEANS OF KEY VARIABLES

Variables	**N=1129**	**N=698**	**N=551**
Strikers	204.70	255.62	212.93
Female strikers	0.0717	0.0860	0.4156
Firms	0.3773	0.4083	0.3303
Strike issues: Multiple	0.2640	0.3338	0.4301
Wage	0.4482	0.3725	0.0835
Union	0.0983	0.1562	0.0544
Work conditions	0.0540	0.0473	0.0980
Other	0.1355	0.0902	0.3339
Strike result: Success	0.2861	0.2637	0.2424
Compromise	0.4005	0.4044	0.4197
Failure	0.3124	0.3319	0.3384
Union involvement		0.7951	0.7405
International union			0.6116
Canadian union			0.3884
Skill	0.6315	0.6289	0.5808
Violence	0.0310	0.0487	0.0563
Location: West	0.2117	0.2507	0.2378
Center	0.6838	0.6719	0.6733
East	0.1045	0.0774	0.0889
Industry: *Apparel*	0.1098	0.1203	0.1071

Building	0.0655	0.0831	0.0835
Unskilled	0.2719	0.2894	0.3013
Food & Tobacco	0.0407	0.0430	0.0345
Machine	0.0204	0.0143	0.0163
Metals	0.0921	0.0860	0.0944
Minning	0.0841	0.0802	0.0944
Shoes	0.0372	0.0372	0.0327
Transport	0.1320	0.1189	0.1180
Wood	0.0434	0.0258	0.0254
Service	0.0337	0.0358	0.0381
Mfg (misc)	0.0469	0.0401	0.0399
GNP	2.4450	2.8227	3.1142
Strike wave	18.410	24.061	28.437

Note: The variables are defined in Appendix 1.

TABLE 2

NUMBER OF STRIKERS, AND MEAN AND MEDIAN DURATION BY ISSUE

		Duration	
Issue	**Strikers**	**Mean**	**Median**
All	1182	22.71	7
Single issue	872	20.20	7
Multiple issue	305	30.07	12
Wage (single and multiple)	803	23.58	8
Wage (single issue)	532	21.33	6
Non-wage	374	20.99	7
Union (single issue)	118	21.14	9
Work (single issue)	66	26.52	9
Misc. (single issue)	156	12.70	5
Union (single and multiple)	234	32.59	12
Non-union	943	20.32	7

TABLE 3

MEAN AND MEDIAN DURATION AND NUMBER OF STRIKES BY INDUSTRY LOCATION AND ISSUE

	Wages Only	**Wages Plus**	**Non Wage**	**Union Only**	**Union Plus**	**Non Union**	**Single Issue**	**Mult. Issues**	**All**
Apparel & textile	11.67 6 55	50.24 20 21	21.21 7 56	25.87 9 15	52.25 21 20	14.97 7 97	15.62 7 104	45.00 20 28	21.86 9 132
Building trades	24.62 11 37	21.09 12 21	31.72 3 18	13.83 2 6	70.50 9 8	20.61 10 62	20.75 9 52	35.25 11 24	25.18 10 77
Unskilled	13.29 7 143	18.15 10 95	13.95 5 77	13.54 6 33	20.18 12 39	14.26 7 243	12.95 5 215	19.15 10 100	14.87 7 316
Food & tobacco	28.33 10 13	72.85 15 13	17.74 11 23	28.40 16 5	148.00 50 4	24.70 9 40	21.49 10 35	69.29 15 14	35.18 11 50
Machine	93.09 9 11	34.71 12 7	17.83 7 6	24.50 19 2		60.23 8 22	66.53 9 17	34.71 12 7	57.25 9 24
Metals	23.24 10 51	25.54 9 24	28.62 7 34	16.38 8 9	60.33 25 6	23.98 9 95	23.27 10 81	31.64 9 28	25.42 10 109
Mining	16.76 6 33	44.61 17 18	32.67 9 48	44.13 28 15	63.38 22 8	23.04 8 76	25.88 7 76	41.61 17 23	29.54 10 99
Shoe & misc. skilled	20.56 16	32.20 7 5	16.09 7 23	20.12 8 8	38.00 12 3	17.23 34 33	16.25 7 36	34.38 8 8	19.54 78 44

Transport & utilities	8.88 4 88	11.36 7 31	14.18 3 38	15.53 4 15	14.64 10 11	9.76 4 131	10.50 4 124	11.21 7 33	10.57 4 159
Wood products	18.71 6 24	14.33 4 6	17.71 7 21	7.75 4 4	1.00 1 1	19.02 7 46	18.91 7 43	11.75 4 8	17.78 7 51
Services & public sector	8.91 4 23	22.44 5 9	8.44 10 9	9.33 10 3	23.67 16 3	10.97 4 35	8.78 4 32	22.44 5 9	11.78 5 41
Manufacturing misc.	121.30 7 23	29.31 7 16	24.00 19 15	46.00 41 3	38.22 11 9	74.69 6 42	84.22 7 37	29.59 11 17	67.02 7 54
Other	15.00 5 14	99.25 79 4	40.67 14 6	41.00 41 1	135.25 149 4	14.16 10 19	15.37 10 19	111.80 149 5	35.46 11 24
Eastern	20.80 7 66	24.90 10 20	27.84 4 38	44.00 2 7	47.25 23 4	21.52 7 113	23.30 6 103	25.19 10 21	23.62 7 124
Central	23.20 6 371	29.70 12 174	19.52 7 257	20.94 10 78	46.91 19 77	20.94 6 647	20.71 7 602	31.62 12 200	23.40 7 803
Western	14.86 7 91	26.22 10 79	23.13 10 82	18.38 11 32	38.92 15 37	17.99 9 183	17.19 7 166	28.67 11 86	21.01 9 256
All	21.33 6 532	11 28 271	20.99 7 374	21.47 9 118	43.90 16 116	20.32 7 943	20.20 7 872	30.07 12 305	22.7 7 1182

Note: For each issue group and industry group or region, the first figure in each column is the mean duration, the second is the median duration in the sample, and the third is the number of strikes.

TABLE 4

NUMBER OF STRIKES, MEAN AND
MEDIAN DURATION AND SURVIVAL RATES BY YEAR

				Survival Rates				
Year	Number	Mean Duration	Median Duration	Day 5	Day 25	Day 50	Day 75	Day 100
1901	78	12.69	5	0.53	0.15	0.06	0.01	0.01
1902	96	14.79	9	0.70	0.15	0.05	0.02	0.01
1903	119	20.24	10	0.68	0.24	0.11	0.06	0.03
1904	80	18.49	10	0.70	0.18	0.09	0.08	0.04
1905	67	13.78	7	0.63	0.13	0.04	0.03	0.01
1906	82	13.60	7	0.65	0.20	0.06	0.00	0.00
1907	121	14.13	7	0.64	0.12	0.04	0.02	0.02
1908	52	18.85	5	0.54	0.19	0.13	0.06	0.04
1909	54	30.18	9	0.65	0.28	0.19	0.11	0.06
1910	60	12.98	6	0.62	0.10	0.03	0.03	0.03
1911	68	17.76	6	0.59	0.18	0.09	0.04	0.04
1912	140	23.15	7	0.64	0.24	0.11	0.09	0.06
1913	122	50.41	10	0.74	0.34	0.17	0.13	0.09
1914	43	65.42	11	0.70	0.42	0.23	0.19	0.19
ALL	1182	22.71	7	0.65	0.21	0.10	0.06	0.04

Note: The survival rate for each year are the proportions of all strikes beginning in that year that lasted at least as long as the stated number of working days.

TABLE 5

DETERMINANTS OF STRIKE DURATIONS

		HAZARD[1]		
Variable	**OLS**[2] **(N=698)**	**I (N=551)**	**II (N=698)**	**III (N=1129)**
Constant (t-stat)	2.2411 (48.05)	2.2188 (43.72)	2.2523 ()49.49	2.0864 (58.13)
Strikers (t-stat) [Δduration]	0.0002 (2.94)	0.0003 (2.56) [0.003]	0.0003 (3.76) [0.002]	0.0002 (3.65) [0.002]
Female strikers	-0.1668 (-0.78)	-0.1663 (-0.70) [-1.43]	-0.1576 (-0.73) [-1.15]	-0.2287 (-1.30) [-1.68]
Firms	0.5454 (4.73)	0.6382 (5.28) [6.30]	0.5769 (5.27) [4.79]	0.6925 (8.14) [6.21]
Strike issues: Multiple	0.6792 (3.50)	0.6759 (2.78) [7.10]	0.7483 (3.74) [6.73]	0.5397 (4.06) [5.01]
Wage	0.3690 (1.99)	0.4661 (1.97) [4.47]	0.4511 (2.28) [3.74]	0.2087 (1.76) [1.71]
Union	0.4344 (2.07)	0.3319 (1.18) [3.52]	0.4590 (2.28) [3.74]	0.2087 (1.76) [1.71]
Working conditions	0.4068 (1.45)	0.4168 (1.39) [4.65]	0.4485 (1.68) [4.30]	0.3315 (1.80) [3.12]
Union involvment	0.6690 (4.55)	0.4908 (2.43) [4.05]	0.7046 (4.55) [4.30]	
International union		0.1853 (1.14) [1.67]		
Year	-30.54 (-2.02)	-29.66 (-0.80) [-0.80]	-31.72 (-2.15) [-2.20]	-28.92 (-2.57) [-0.48]
Year x year	0.0080 (2.02)	0.0079 (0.80)	0.0083 (2.16)	0.0076 (2.57)]
Skill	0.1598 (1.35)	0.2656 (2.21) [2.40]	0.2219 (1.97) [1.68]	0.3195 (3.76) [2.48]

		HAZARD[1]		
Variable	**OLS[2] (N=698)**	**I (N=551)**	**II (N=698)**	**III (N=1129)**
Violence	0.6605 (2.88)	0.7916 (3.60) [10.62]	0.7058 (3.45) [7.69]	0.8998 (4.73) [11.46]
Location: West	-0.0062 (-0.05)	-0.0285 (-0.21) [-0.26]	-0.0303 (-0.25) [-0.23]	0.1141 (1.17) [0.95]
East	0.0896 (0.48)	0.1877 (0.94) [1.87]	0.1152 (0.60) [0.94]	0.0588 (0.46) [0.49]
Legislation (1907)	-0.0532 (-0.21)	-0.2627 (-0.83) [-2.61]	-0.1209 (-0.49) [-0.96]	-0.3692 (-1.99) [-2.94]
Industry effects: Apparel & textile	-0.0214 (-0.06)	-0.0987 (-0.27) [-0.87]	-0.0305 (-0.09) [-0.23]	-0.3290 (-1.25) [-3.03]
Building	-07885 (-2.28)	-1.1257 (-3.25) [-6.83]	-0.7763 (-2.53) [-4.47]	-0.3182 (-1.22) [-2.25]
Unskilled	-0.7698 (-2.46)	-0.9623 (-3.10) [-7.60]	-0.7566 (-2.70) [-5.13]	-0.3115 (-1.33) [-2.35]
Food & tobacco	0.0617 (0.16)	-0.3621 (-0.93) [-2.83]	0.0882 (0.26) [0.71]	0.7056 (2.46) [8.04]
Machine	0.6964 (1.39)	0.3236 (0.70) [3.50]	0.7767 (1.80) [8.85]	0.5866 (1.76) [6.36]
Metals	-0.0055 (-0.02)	-0.3255 (-0.95) [-2.63]	-0.0330 (-0.11) [-0.25]	0.1962 (0.77) [1.72]
Mining	-0.0064 (-0.02)	-0.2610 (-0.78) [-2.15]	0.1011 (0.33) [0.82]	0.2144 (0.84) [1.90]
Shoes	-0.0396 (-0.10)	-0.0415 (-0.10) [-0.37]	0.0327 (0.09) [0.26]	0.4076 (1.38) [4.00]
Transport	-0.8917 (-2.72)	-1.1478 (-3.48) [-7.19]	-0.8709 (-2.94) [-5.01]	-0.6123 (-2.51) [-4.01]

		HAZARD[1]		
Variable	**OLS[2] (N=698)**	**I (N=551)**	**II (N=698)**	**III (N=1129)**
Wood	-0.5950 (-1.39)	-0.9010 (-1.83) [-5.59]	-0.5194 (-1.14) [-3.18]	-0.0449 (-0.16) [-0.35]
Service	-0.7233 (-1.84)	-0.9540 (-2.50) [-5.86]	-0.6509 (-1.83) [-3.80]	-0.1771 (-0.59) [-1.32]
Manufacturing misc.	-0.1841 (-0.48)	-0.5662 (-1.44) [-4.07]	-0.2694 (-0.76) [-1.85]	0.2335 (0.79) [2.00]
Output effects: GNP	-0.0225 (-0.84)	-0.0221 (-0.57) [-0.21]	-0.0206 (-0.64) [-0.16]	-0.0153 (-0.96) [-0.12]
UnionpresencexGNP	0.0025 (0.15)	0.0023 (0.12) [0.02]	-0.0009 (-0.05) [-0.01]	
UnionissuexGNP	0-0168 (0-61)	0.0410 (1.01) [0.38]	0.0211 (0.69) [0.17]	0.0226 (1.01) [0.18]
WorkissuexGNP	-0.0276 (-0.79)	-0.0221 (-0.57) [-0.21]	-0.0348 (-1.00) [-0.27]	-0.0128 (-0.68) [-0.10]
WageissuexGNP	-0.0295 (-1.24)	-0.0357 (-1.04) [-0.32]	-0.0347 (-1.23) [-0.26]	-0.0237 (-1.39) [-0.19]
MultipleissuexGNP	-0.0155 (-0.62)	-0.0124 (-0.35) [-0.11]	-0.0161 (-0.57) [-0.12]	-0.0128 (-0.68) [-0.10]
Strike wave	0.0043 (1.94)	0.0027 (1.07) [0.02]	0.0042 (1.96) [0.03]	0.0028 (1.91) [0.02]
Log of likelihood function	-1118.21	-2099.40	-2689.24	-4216.43

Note: Value in ( ) are t-statistics; value in [ ] are changes in duration as defined in text. The control for location is central Canadian strikes; the control fir industry is 'Other' (defined in Appendix 1); the control for strike issue is miscellaneous.

[1] Maximum likelihood estimation.

[2] For the OLS regression the dependent variable is the ln(strike duration). F - statistic = 7.4092; Mean of dependent variable = 2.2411; R^2 = .275.

TABLE 6

SUMMARY STATISTICS

	Sample Size		
Statistic/Coefficient	**Small**	**Medium**	**Large**
Constant[1]	2.2188	2.2523	2.0864
Standard error	0.0507	0.0455	0.3584
t statistic	43.72	49.49	58.13
Estimated median	9.1967	9.5101	8.0371
Standard error	0.4667	0.4327	0.2877
t statistic	19.70	21.98	28.06
Estimated E(ln(duration))	2.2188	2.2523	2.0888
Standard error	0.0507	0.0455	0.0354
t statistic	43.72	49.49	58.13
Sample mean of ln(duration)	2.2174	2.2411	2.1073
Sample mean of duration	30.1717	28.6332	23.0339
Sample median of duration	9.00	9.00	8.00
Conditional moment test[2]	4.78	8.67	27.88

Notes: [1] Based on a regression with explanatory variables expressed as deviations from trend. In this form the exp(constant) provides an estimate of the empirical hazard rate for a strike where all of the variables are at their mean values. With a log-logisitic specification and explanatory variables in deviations, the constant is also an estimate of the expected value of log duration.

[2] Test described in Jaggia (1991) and Kiefer (1988). This is a general specification test designed to capture effects of omitted variables and heteroskedasticity. The version we use is based on the 2nd, 3rd, and 4th moments of the generalized residuals and has 3 degrees of freedom.

TABLE 7

Business Cycle Effects by Strike Issue

	HAZARD		
Strike Issue	**(N=551)**	**(N=698)**	**(N=1129)**
Multiple issue	-0.03449 (-1.39)	-0.03669 (-1.59)	-0.02814 (-2.10)
Union only	0.18554 (0.57)	0.00053 (0.02)	0.00730 (0.42)
Work only	-0.04487 (-1.54)	-0.05535 (-2.00)	-0.03364 (-1.45)
Wage only	-0.05785 (-2.92)	-0.05524 (-2.96)	-0.03906 (-3.93)

Note: For each strike issue, the first figure is the estimated coffecient calculated from Table 5 and the second is the corresponding t-statistic.